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Theme

Bio-Bibliometrics

DR. BIMAN BAGCHI A BIOBIBLIOMETRIC PORTRAIT

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Analyses bibliomertrically 226 publications [Papers published in journals-220, thesis [others 4] by Biman Bagchi, a renowned physical chemist from India, published during 1981 to 2002. The first contribution of the author was in 1981 at the age of 27. The number of his contributions in a year peaked in 1999 and 2002 when it touched 19. The author is highly productive inasmuch as on average the author has produced 10 papers per year. In the beeline of authorship, Bagchi occupies the first authorship position in 69 cases. His collaborator A Chandra occupies the first authorship position in 30 papers thus becoming Bagchi's closest collaborator. The journal has been the most preferred channel of communication of the author inasmuch as 220 papers out of 226 have been placed in journals. J. Chem Phys is found to be the most preferred journal that carried 91 papers of the author, followed by Chem Phys Lett (21 papers). J. Phys Chem (19 papers), Proc Indian Acad Sci – Chem Sci (13 papers), and others. Of the papers, 179 received 4030 citations and 47 received no citations. It is expected that more than 20 uncited papers till 2002 will receive citations in future. Three papers of the author have received more than 200 citations each, and another three received between 100-200 citations each. The number of papers receiving 10 citations or more total 92. On four different years the scientist has received more than 300 citations and his citation rate per paper has peaked at 18.98. The article shows with a concrete example the growth, peaking and declining of citation rate. A few new terms such as citation gain, citation loss, gaining citation rate and losing citation rate have been introduced and described.

0 Introduction

Biobiblioemctrics is one of the branches of bibliometrics that studies the contributions of scientists and others and the citations reccived by thc contributions made by them. The field is comparatively new and contributors to this field are not many. Of course, two of the greatest contributors in this field from India are VL Kalyane and BS Kademani who are continuously working on this new field for years. Their biobibliometric studies have already covered such renowned scientists as Vinodini Reddy [1]. P K Iyengar [2] C V Raman [3], C S Venkata Ram [4], U R Murty [5], M S Swaminathan [6], R Chidambaram [7.11.16], T S West [8], K Ramah [9] P M Bhargava [10], S Chandrasekhar [12], K S Krishnan [13], Pierre-Gilles de Gennes [14], Barbara McClintock [15]. C R Bhatia [17], Dorothy Crowfoot Hodgkin [18], Vikram A Sarabhai [19], Tibor Braun [20] and a few others. In this paper we are attempting a biobibliometric study of Dr Biman Bagchi.

Dr. Biman Bagchi, Professor and Chairman, Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore was born on 1st January 1954. After the completion of his Masters degree in science he obtained his PhD in 1981 from the Brown University, Providence, USA. His area of interest has been broadly physical chemistry and solution dynamics. At present, he along with his group is engaged in conducting research in such areas as chemical reaction dynamics; solvation and solvation dynamics of charged species in polar liquids; collective orientational relaxation; electrochemistry; transport properties; polymer dynamics and polymer reactions; biophysical chemistry; molecular dynamics in restricted geometries; dynamics near isotropic nematic phase transition; dynamics of supercooled liquids; and application of mode coupling theory to liquid state dynamics [21]. Dr Bagchi is one of the top ranking scientists produced by India and also one of the most highly cited scientists of the world. The importance of his contributions can be gauged from the numerous honours and awards he has received so far. Some of them are: National Merit Certificate (1971); First Degree State Scholarship (1971-74); Young Associate, Indian Academy of Science (1985-89); Young Scientist Medal, Indian National Science Academy (1986); Homi Bhabha Fellow (1989-91); A K Bose Memorial Award (1990); S S Bhatnagar Award in Chemical Sciences (1991); Fellow, Indian Academy of Science (1991); Fellow, Indian National Science Academy (1994); Fellow, National Academy of Science (1995); Seventh G D Birla Award for Science and Technology (1997); Alumni Excellence Award in Research, Indian Institute of Science (2002); Silver Medal, Chemical Research Society of India (2003) [22].

Dr Bagchi's first paper was published in 1981. From 1981 till 2002 he has published 226 papers mostly in high impact journals of the world. Till 2002 all these papers have received more than 4000 citations, possibly making him one of the most cited scientists from India. On four occasions his papers have received more than 300 citations per year.

Definitions – Several new terms have been introduced in this paper which are described below.

Citation gain -The phenomenon or receiving citations.

Citation loss -The phenomenon occurs due to some papers getting less citations compared to the previous year or no citation at all.

Citation rate -The number of citations per paper in a given year.

Gaining citation rate (GCR)- The citation rate gained by the citations received in a given year.

Losing citation rate (LCR) -The loss in citation rate caused by the receipt of loss citations or no citations by those papers which received citations last year.

Peak citation rate -The highest citiation rate achieved by a scientist within a given span of time.

2 Objectives

The objectives of the study are to find out.

1) the year-and age-wise distribution of papers by the scientist;

2) the pattern of primary authorship;

3) the journal preference of the scientist;

4) Citation pattern of the publications and the high impact papers;

5) Year-wise distribution of citations and citation rates.

3 Methodology

The list of publications of the scientist [22] mentioning the first author in each case was first analysed to determine the year-wise distribution of the publications and journal preference. The author's biodata as available in the Internet was used [22] for finding out the age-wise distribution of the publications. Using the first author and the bibliographical details of each paper, the citation data for each paper was collected from *Science Citation Index* covering the years 1981 to 2002 which was further analysed to find out the year-wise distribution of citations, citation rate per year etc.

4 Analysis

Age-wise Distribution of Publications

Dr Bagchi's first paper was published in 1981 at the age of 27. The year saw three publications by the author. The yearly productivity of the author went on increasing with the advancement of his age and peaked in his late 40s with 19 publications in 1999 and 2002. The author is now 49 and it cannot be said that his yearly productivity will not surpass the figure of 19 in the coming years. Table 1 shows the age/year-wise distribution of papers and Bagchi as the first author.

Table 1 : Year/Age-wise Distribution of Papers and Bagchi as Primary Author

Year	Age	No. of Papers	Bagchi as Primary Author
1981	27	3	2
1982	28	4	
1983	29	9	9
1984	30	3	
1985	31	8	5
1986	32	6	6
1987	33	10	10
1988	34		3
1989	35	4	6
1990	36	14	6
1991	37	10	4
1992	38	7	1
1993	39	12	3
1994	40	9	1
1995	41	8	
1996	42	11	0
1997	43	11	0
1998	44	10	2
1999	45	19	2
2000	46	11	0
2001	47	17	3
2002	48	19	0
	Total	226	69

5 Primary Authorship

In the beeline of authorship, the first author is termed as the primary author. There is no internationally accepted practice as to who should become the primary author in a collaborative publication. However, the most ethical practice is the one where the status of the authorship is determined on the basis of intellectual contribution. The scientist whose intellectual contribution is found to be maximum is given the primary authorship followed by others depending on the quantum of their intellectual contribution. Unfortunately this practice is not followed everywhere. In some case, the head of the team, the head of the department, or the head of the institution uniformly becomes the primary author not by virtue of his contribution but by virtue of the position he holds. There are also cases where some selfless scientists put the names of their juniors as the first authors to project them in the world and their own names as the last author. Table 1 shows that in the initial years of his career Bagchi remained primary authors in most cases and his primary authorship peaked in 1987 when at the age of 33 he was the primary author of all the ten publications published in that year by him. The situation changed thereafter. Gradually, Dr. Bagchi chose not to be the first author most probably to give his juniors the coveted position. Out of 226 papers only in 69 papers Dr Bagchi is the first author! Other authors who collaborated with Dr Bagchi and occupied the position of first authorship in the papers are as follows : S. Balasubramanian (4 papers). K. Bhattacharyya (1 paper). S. Bhattacharyya (9 papers), R. Biswas (13), EW Castner (2 papers), EW Castner Jr. (1 paper), C. Cerjan (2 papers), A. Chandra (30 papers), RA Denny (2 papers), JF Dufreche (1 paper), N. Gayathri (9 papers), JH Gibb (1 paper), SD Gottke (2 papers), D. Hong (1 paper), PP Jose (1 paper), SS Komath (1 paper), M. Marocelli (2 papers), K. Miyazaki (2 papers), U. Mohanty (1 paper), A. Morita (1 paper), A. Mukherjee (2 papers), R. K. Murarka (4 papers), N. Nandi (9 papers), Okumura K. (1 paper), S. Pal (2 papers), A. Perera (1 paper), C. S. Poornimadevi (3 papers), PL Radloff (1 paper), S. Ravichandran (10 papers), SA Rice (1), S. Roy (11), A. Sethia (1), G. Srinivas (11 papers), R. Vasanthi (3 papers), GV Vijaya Damodar (5 papers), KF Wong (1 paper), R. Zanzig (1 paper) and H. X. Zhou (2 papers). From the list it appears that A Chandra has been his closest collaborator, followed by R. Biswas, S. Roy, G. Srinibas, S. Ravichandran and others. The list of collaborators given above bears testimony to the fact that the collaborative pattern of Dr Biswas was international. He has collaborated with Chinese, Japanese, American, European and scientists from various parts of India.

6 Journal Preference

Selection of a journal is an important factor in the publication of a paper. A seminal paper published in an internationally well-known journal attract the attention of the world practically in no time. On the other hand an important paper published in an obscure journal may remain unnoticed for years. Of the 226 contributions of Bagchi one is a thesis, one paper was published in a conference proceedings and four papers were published in books. The remaining 220 papers were published in 38 journals (Table 2). It may be seen from the Table that the largest number of papers were placed in *J Chem Phys* (91), followed by *J Phys Chem* and its Sections (31), *Proc Indian Acad Sci Chem Sci* (13) and others. Almost all the journals are found to be SCI-covered journals and many of

them are having high impact factors. Of the journals figuring in Table 2, the following are the Indian Journals. *Curr Sci, Indian J Chem - A. Indian J Phys -A, J Indian Chem Soc, Proc Indian Acad Sci–A,* and *Proc Indian Acad Sci - Chem Sci.* The list bears testimony to the fact that the author has selected in most cases the best journals for placing his papers.

Table 2 : Journal Preference of Bagchi

S. No.	Name of the Journal	No. of Papers Published
	J Chem Phys	91
	Chem Phys Lett	21
	J Phys Chem	19
	P I A S Chem Sci	13
5	Phys Rev Lett	8
6	J Phys Chem B	6
	Chem Phys	5
8	J Phys Chem A	5
9	Adv Chem Phys	
10	Curr Sci	4
1	Phys Lett A	4
12	J Am Chem Soc	3
13	Phys Rev A	3
	Phys Rev B	3
	Indian J Chem A	2
16	Int Rev Phys chem	2
	J Mol Liq	2
I8	J Mol Struct	2
19	Phys Lett	2
20	Physica A	2
	Rev Solid State Sci	2
22	Acc Chem Res	1
23	Ann Rev Phys Chem	1
24	B Chem Soc Jpn	1
25	Ber Buns Chem	
26	Chem Rev	
27	Cond Matt Phys	1
28	Faraday Discussions	1
29	Indian J Phys A	
30	Int Rev Mod Phys	
31	J Indian Chem Soc	
32	J Mol Struct (Theo Chem)	1
33	J Phys Chem (Lett)	
34	J Phys Soc Jpn	
35	J Stat Phys	
36	Proc Indian Acad Sci -A	
37	Proc nat Acad Sci USA	
38	Phase Transitions	

Contd.

7 Citation Count

Of the 226 publications, 179 publications have been cited and received in all 4030 citations (Table 3). It is not known the papers of how many other scientists of India have received more than 4,000 citations in a period of just 21 years. From our experience we can say that very few scientists of our country might have attained the figure of 4000+ citations. Three papers of the scientist have been cited more than 200 times each and another three have been cited between 101–200 times each. Ten papers have been cited between 51–100 times each. In all there are 92 papers which have been cited 10 times or more. Of the non-cited papers, 22 that published during 1981 to 1997 are unlikely to be cited in future. Another set of 25 papers published during 1998–2002 have not yet been cited but are likely to be cited in future. On average there are 22.51 citations per cited publication and 17.83 citations per publication (cited and uncited). The citation pattern of the publications narrowly miss Bradford distribution.

Table 3 : Citation Count of the Papers by Bagchi

Rank	No of Citations	First Author	Location of the Paper (Jl, Yr, Vol 1st Page)	Cumulative Total of Citations
	295	Bagchi B	Ann Rev Phys Chem 1989, 4,115	295
2	239	Bagchi B	Chem Phys 1984, **86**, 257	534
3	206	Bagchi B	Adv Chem Phys 1991, **80**, 1	740
	189	Bagchi B	J Chem Phys 1983 **78**, 7375	929
	164	Bagchi B	J Phys Chem 1983, **78**, 2735	1093
6	139	Bagchi B	J Chem Phys 1990, **94**, 9	1232
	92	Castner EW	J Chem Phys 1988, **89**, 3519	1324
8	91	Castner EW	Ber Buns Chem 1988, **92**, 363	1415
	71	Chandra A	J Phys Chem 1989, **93**, 6996	1486
10	69	Chandra A	Chem Phys Lett 1988, **151**, 47	1555
11	66	Nandi N	J Chem Phys 1995, **102**, 1390	1621
12	66	Chandra A	J Chem Phys 1989, **90**, 1832	1687
13	59	Bagchi B	J Chem Phys 1989, **90**, 7338	1746
14	56	Castner EW, Jr	Chem Phys Lett 1988, **143**, 270	1802
15	55	Roy S	J Chem Phys 1993, **99**, 1310	1857
16	50	Nandi N	Chem Rev 2000, **100**, 2013	1907
17	44	Bagchi B	J Chem Phys 1994, **100**, 6658	1951
17	44	Bagchi B	J Chem Phys 1983, **79**, 5595	1995
19	43	Bagchi B	J Chem Phys 1992, **97**, 5126	2038
20	42	Bagchi B	Int Rev Phys Chem 1987, **6**, 1	2080
21	41	Bagchi B	J Chem Phys 1991, **95**, 467	2121
21	41	Nandi N	J Phys Chem 1996, **100**, 13914	2162
21	41	Roy S	J Chem Phys 1993, **99**, 3139	2203
24	40	Chandra A	J Chem Phys 1989, **91**, 1829	2243
25	39	Biwas R	Phys Rev Lett 1995, **75**, 1098	2282
26	38	Bagchi B	Chem Phys Lett 1989, **155**, 533	
27	37	Zhou H X	J Chem Phys 1992, **97**, 9311	
28	35	Bagchi B	Phys Rev Lett 1990, **64**, 455	2392
28	35	Nandi N	J Phys Chem B 1997, **101**, 10954	2427

Contd.

28	35	Chandra A	J Chem Phys 1989, **91**, 2594	2462
31	34	Bhattacharyya S	J Chem Phys 1997, **106**, 1757	2496
31	34	Bagchi B	Chem Phys Lett 1983, **99**, 225	2530
33	32	Chandra A	J Chem Phys 1989, **91**, 3056	2562
33	32	Bagchi B	Chem Phys Lett 1985, **115**, 209	2594
35	30	Bagchi B	J Chem Phys 1990, **94**, 5197	2624
36	29	Chandra A	J Chem Phys 1991, **94**, 8367	2653
36	29	Chandra A	J Phys Chem 1990, **94**, 3152	2682
38	28	Bagchi B	Chem Phys Lett 1987, **135**, 558	2710
39	27	Bagchi B	Physica A 1987, **145**, 273	2737
40	26	Roy S	J Chem Phys 1994, **100**, 8802	2763
40	26	Bagchi B	Phys Rev B 1984, **29**, 2857	2789
42	25	Roy S	J Chem Phys 1994, **101**, 4150	2814
42	25	Bagchi B	J Chem Phys 1987, **87**, 5393	2839
44	24	Bagchi B	Adv Chem Phys 1999, **109**, 207	2863
44	24	Chandra A	J Chem Phys 1993, **99**, 553	2887
44	24	Chandra A	Chem Phys 1991, **156**, 323	2911
47	23	Nandi N	J Phys Chem (Lett) 1998, **102**, 8217	2934
47	23	Biswas R	J Chem Phys 1997, **106**, 5587	2957
47	23	Ravichandran S	Int Rev Phys Chem 1995, **14**, 271	2980
	23	Roy S	Chem Phys 1994, **183**, 207	3003
47	23	Zhou H X	J Chem Phys 1992, **97**, 3610	3026
52	22	Bagchi B	J Phys Chem 1982, **86**, 2197	3048
53	21	Bagchi B	J Chem Phys 1985, **82**, 5677	3069
54	20	Bagchi B	Proc Indian Acad Sci-Chem Sci 1988, **100**, 353	3089
54	20	Bagchi B	J Chem Phys 1983, **79**, 6222	3109
56	19		4 papers	3185
60	18		4 papers	3257
64	17		3 papers	3308
67	16		3 papers	3356
70	15		5 papers	3431
75	14		4 papers	3487
79	13		5 papers	3552

Contd.

84	12	2 papers	3576
86		4 papers	3620
90	10	3 papers	3650
93	09	6 papers	3704
99	08	9 papers	3776
108	07	7 papers	
115	06	7 papers	3867
122	05	9 papers	3912
131	04	14 papers	3968
145	03	8 papers	3992
153	02	11 papers	4014
164	01	16 papers	4030
180	0	47 papers	4030
	Total	226 papers	4030

Year-wise Distribution of Citations

Table 4 depicts the year-wise distribution of citations received by the papers contributed by the scientist either singly or jointly. It may be noted that Dr Bagchi started contributing papers from 1981 in which year his publications did not receive any citation. From 1982 onwards his publications started receiving citations. Citations per publication i.e. the citation rate went on increasing till 1998 when it peaked at 18.98. Thereafter it started showing a gradual decline. What we see here is initial growth, then peaking and finally gradual decline. Possibly this is a universal phenomenon. We do not know of any other study describing this phenomenon. In the case of every good and optimally productive scientist this is going to happen. This is because, in the initial years of the career of a scientist his papers will continuously receive citations and the citation rate will go on increasing year after year. However, a time will come when some of his initial papers will start getting less and less citations and finally stop getting any citation. Here is a case of **citation loss** and **citation gain**. On the one side the scientist is gaining in citation rate because of his more recent papers which are receiving citations, and losing in citation rate because of the older papers which are receiving less citations or no citations. As long as the **gaining citation rate** (GCR) is more than the **losing citation rate** (LCR), the citation rate will grow. When it is equal the rate will be static, and when GCR < LCR, the citation rate will decline.

It may be seen from column 2 of Table 4 that in 1991, 1995, 1998 and 1999 the number of citations received exceed 300 mark and in 10 different years this figure varied between 101–200. Only on 4 initial years the number of citations per year was below 50. Undeniably it speaks of the excellent quality of the papers contributed by the scientist.

Table 4 Year-wise Distribution of Citations

Year	Citations Received	Cumulative Total of Citations	Cumulative Total of Publications	Citations per Publication Col 34Col 4
1981	0	0	3	0
1982	2			0.29
1983	24	26	16	1.63
1984	20	46	19	
1985	82	128	27	4.74
1986	7	199	33	6.03
1987	150	349	43	8.12
1988	114	463	5	8.57
1989	74	637	68	9.37
1990	200	837	82	10.20
1991	341	78	92	12.80
1992	196	137	99	
1993	291	1665		15.00
1994	260	1925	120	16.04
1995	301	2226	128	17.39
199€	278	2504	39	18.01
1997	219	2723	150	18.15
1998	313	3036	160	18.98
1999	312	348	79	18.70
2000	201	549	190	18.67
20C	186	3735	207	
2002	295	4030	226	17.83

8 Conclusion

Biobibliometric studies conducted in the world are not very many. In India most of the biobibliometric studies have been conducted by V L Kalyane either singly or along with his associates. Biobibliometric studies map the achievement of scientists in many ways and prove quite useful to them. This particular study has tried to highlight the contributions made by Dr Bagchi and the citations received by those contributions. The citation analysis provides enough indication to state that Dr Bagchi is one of the top-ranking scientists of the country and may become one of the great scientists ever produced by India. He has already received almost all national honours and awards. His election as a Fellow of the Royal Society and winning of other international awards including

the Nobel Prize are distinct possibilities

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